

REMARKS/ARGUMENTS

This is a Response to the Office Action mailed May 7, 2003, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire August 7, 2003. Enclosed is our check to cover the fee for a three-month extension of time, to November 7, 2003. Twenty-six (26) claims, including four (4) independent claims, were paid for in the application. Claim 10 has been canceled. Claims 4-8, 11-15, 19 and 25 have been amended. No new matter has been added to the application. Enclosed is our check to cover the fee for two additional independent claims due by way of this Amendment. The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090. Claims 1-9 and 11-26 are pending.

Applicants thank Examiner Kalafut for allowing claims 16-26, and for indicating the allowable subject matter of claims 4, 5, 7, 8 and 11-15.

Objections

The drawings were objected to because the numeral 47 in Figure 4 is used to indicate two different things. Figure 4 is amended to remove one of the elements previously identified with the reference number 47.

Additionally, the drawings were objected to because the numeral 706 in Figure 5 is used to indicate two different things, and because the numeral 761 in Figure 6 is not identified in the specification. Figure 5 is amended to replace one occurrence of the reference numeral 706 with the reference numeral 702 identifying the air supply aperture. Figure 6 is amended to remove the reference numeral 761 as not identifying any of the claimed structure.

Thus, Figures 4-6 have been amended and three (3) replacement sheets of drawings are presented herewith for approval.

The specification was objected to because of informalities which are corrected by the amendments above.

Claims 4, 5, 7 and 8 were objected to as being dependent on a rejected base claim, and were further rejected under 35 U.S.C. 112, second paragraph. Claim 4 has been rewritten in

independent form to include all of the limitations of the base claim and any intervening claims, and claims 5, 7 and 8 have been amended to depend from claim 4. Further, claims 4, 5, 7 and 8 have been amended to address the rejection under 35 U.S.C. 112, second paragraph. Claims 4, 5, 7 and 8 are thus allowable.

Claims 11-15 were objected to as being dependent on a rejected base claim. Claims 11 and 12 have been rewritten in independent form to include all of the limitations of the base claim and any intervening claims, and claims 13-15 have been amended to depend from claim 12. Claim 15 was objected to because of informalities which are corrected by the amendments above. Claims 11-15 are thus allowable.

It is noted that in rewriting the claims in independent form, the scope of the claims has not changed and the amendment should not be considered as narrowing the scope of the claims.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-9 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter which Applicants regard as the invention. In particular, the Examiner suggests that associating the "high hydrogen condition" with "the oxygen reading from the oxygen sensor" is confusing. A new paragraph is added to the description to further clarify this aspect of the invention of claim 1. Support for this amendment may be found at page 20, line 18 – page 22, line 12, of U.S. Serial No. 09/916,241, filed July 25, 2001, which was incorporated by reference in the present application.

In particular, it is possible to determine a high hydrogen condition due to a low oxygen condition since an increase in hydrogen concentration as a percentage of the ambient environment will result in a corresponding decrease in oxygen concentration as a percentage of the ambient environment. By carefully selecting the threshold values, the oxygen sensor serves as *either* a replacement for, or a backup to, the hydrogen sensor. This alternative use of an oxygen sensor to detect a high hydrogen condition, in addition to or in place of detecting a low oxygen condition, is clearly *not* recognized in the prior art.

Claim 6 was objected to under 35 U.S.C. 112 second paragraph because the term "high hydrogen oxygen condition" is unclear. Claim 6 has been amended to address the rejection.

35 U.S.C. §102(b) Rejections

Claims 1-3, 9 and 10 were rejected under 35 U.S.C. §102(b) as being anticipated by Ito et al. (Japanese Patent No. 60-158,557).

The disclosed embodiment of the invention will now be discussed in comparison to the applied reference. Of course, the discussion of the disclosed embodiment, and the discussion of the differences between the disclosed embodiment and the subject matter described in the applied reference, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner to appreciate important claim distinctions discussed thereafter.

As discussed above, in certain aspects Applicants disclose the use of an oxygen sensor to detect high hydrogen conditions in the fuel cell system ambient environment. This may be in place of a hydrogen sensor, or in addition to a hydrogen sensor to provide redundancy to the fuel cell system.

Ito is generally directed to a fuel cell power generating system. In particular, Ito is directed to monitoring reactant crossover at the electrode membrane, for example, where there is a hole in the electrode membrane. Ito discloses an oxygen sensor positioned to detect oxygen in a fuel (*i.e.*, hydrogen) exhaust line on the fuel outlet side (*i.e.*, anode) of the electrode membrane. Ito discloses a separate inflammable gas sensor (*i.e.*, hydrogen sensor) positioned to detect hydrogen in an oxygen exhaust line on the air electrode outlet side (*i.e.*, cathode) of the electrode membrane. An alarm is provided if the oxygen sensor detects any oxygen in the fuel (*i.e.*, hydrogen) exhaust line. Note that where a leak exists, oxygen will migrate into the fuel exhaust line if the pressure in the oxygen supply system is higher than the pressure in the fuel supply system. Likewise, an alarm is provided if the hydrogen sensor detects any hydrogen in the oxygen exhaust line. Note that where a leak exists, hydrogen will migrate into the oxygen exhaust line if the pressure in the fuel (*i.e.*, hydrogen) supply system is higher than the pressure in the oxygen supply system.

Importantly, there is no teaching or suggestion to use the oxygen sensor to detect a high hydrogen condition. In fact, Ito teaches the use of an oxygen sensor to detect oxygen in the fuel exhaust line, which typically carries a high concentration of hydrogen. Thus, at most this might be characterized as detecting a lower hydrogen condition in the fuel exhaust line, since the presence of oxygen would reduce the concentration of hydrogen as a percentage of the total gas in the fuel exhaust line.

Additionally, Ito teaches the use of *separate* sensors for detecting each of the specific conditions, *i.e.*, 1) oxygen sensor to detect oxygen in the fuel exhaust line fuel, and 2) hydrogen sensor to detect hydrogen in the oxygen exhaust line. This teaches away from the use of a oxygen sensor to indirectly detect hydrogen, let alone, to detect a defined concentration of hydrogen.

Further, the exhaust lines are part of closed oxygen and hydrogen supply systems, recycling the hydrogen and oxygen. Thus, Ito teaches monitoring the oxygen and hydrogen supply systems, *not* the ambient environment.

Turning to the specific claim language, claim 1 recites, *inter alia*, “an oxygen sensor” and “a switch couplable to the fuel cell assembly and selectively actuatable to stop fuel cell operation in response to *a high hydrogen condition indicated by an oxygen reading from the oxygen sensor.*” As discussed above, a high hydrogen condition can be detected by use of an oxygen sensor since an increase in the percentage of hydrogen in the fuel cell ambient environment will be accompanied by a corresponding decrease in the percentage of oxygen in the ambient environment. Thus an oxygen sensor can replace the hydrogen sensor. Alternatively, the oxygen sensor can provide redundancy to the hydrogen sensor without incurring the additional cost, weight and space associated with providing two separate hydrogen sensors. The cited art does not recognize this dual function aspect of the oxygen sensor.

Amended claim 6 is dependent on claim 1 and further recites “wherein the switch takes the form of a programmed controller configured to compare the oxygen reading to a low oxygen threshold value of approximately 18 percent to determine an existence of the high hydrogen condition.” As explained above, the careful selection of the thresholds permits the

oxygen sensor to provide redundancy to the hydrogen detecting function, while also detecting low oxygen conditions. This dual functionality is not taught or suggested in the art.

Conclusion

Overall, the cited references do not singly, or in any motivated combination, teach or suggest the claimed features of the embodiments recited in independent claims 1, 4, 11, 12, 16 and 22, and thus such claims are allowable. Because the remaining claims depend from allowable independent claims 1, 4, 11, 12, 16 and 22, and also because they include additional limitations, such claims are likewise allowable. If the undersigned attorney has overlooked a relevant teaching in any of the references, the Examiner is requested to point out specifically where such teaching may be found.

In light of the above amendments and remarks, Applicants respectfully submit that all pending claims are allowable. Applicants, therefore, respectfully request that the Examiner reconsider this application and timely allow all pending claims. Examiner Kalafut is encouraged to contact Mr. Abramonte by telephone to discuss the above and any other distinctions between the claims and the applied references, if desired. If the Examiner notes any informalities in the claims, he is encouraged to contact Mr. Abramonte by telephone to expediently correct such informalities.

Respectfully submitted,

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Enclosures:

Postcard

3 Replacement Sheets of Drawings (Figs. 2 and 4-6)

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